PARKER's Projection OF THE LONGITUDE AT SEA:

Whereby the Mariners may be enabled to correct their Accounts thereof, as often as they shall have the Benefit of a CLEAR SKY and CALM SEA, at the Time of the Moon's visible Southing.

Communicated to and approved of by Dr. *HALLEY*, Astronomer Royal.

Et Cœlo Terras ostendit, et Æthera Terris,
nec Maris Ira manet. Ovid

Licensed and Enter'd according to Order.

By BENJAMIN PARKER.

K

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PRAYER: Projection

OF THE

LONGITUDE

BY

LUNA:

To the Right Honourable the

Earl of *Chesterfield*,

And the Honourable

Sir *Nathaniel Curzon*, Bart.

THESE Projections I humbly Dedicate, hoping, that their Worth and Usefulness will screen me from your Resentments, in making Bold to offer a Work of this Nature to your Honours Patronage, and entitle me to your Honours Interest, which I humbly beg, as far as I shall be found Worthy, Being

Your Honours Countryman,

AND

Most humble Servant,

Horsley, Derbyshire, near Derby, March 26. 1731.

BENJ. PARKER.

THE

PREFACE.

To all Ingenious and Judicious Readers.

GENTLEMEN,

THE following Scheme to diſcover the Longitude at Sea, has been drawn up by me ſix Years ago, and ſent up to *London* to have it examin'd by proper Judges of ſuch Affairs; and Intereſt being made to have the Judgment of the Great Dr. *Halley* upon them, he received them with Approbation, and kept them ſome Time, in Order to make Obſervations therefrom, that he might know to what Account they wou'd anſwer; after which he reported, that thro' the Moon's uncertain Calculation at that Time, it not being brought to an Exactneſs, ſo as to anſwer Obſervation, they could not then be uſeful, but that they would certainly be the moſt ſerviceable of any that had been before offer'd, whenever the Moon's Motion was brought to a Truth of Calculation, which he then hop'd to perform, (if it

pleaſed

pleaſed God to continue him in Health to go thro' with it: Theſe Anſwers I received from my Friend I ſent them up to, and have ſince had the Honour and Freedom of the Great Dr. *Halley's* Company and Converſe, who told me he hop'd to perfect the Moon's Motion by the End of the Year 1730, and being again with him laſt Chriſtmas, even he aſſur'd me he had compleated it.

I have therefore thought proper at this Juncture, to make theſe Propoſals publick, that the World may ſee from whence this Method had its Original, and enjoy the Benefit thereof; and as I would allow the Great Dr. *Halley* all the Honour and Praiſe he is worthy of, for his elaborate Care and Pains he has been at in rectifying the Moon's moſt precarious Motion, in which he alone has had the wiſh'd for Succeſs, having a Genius both adapted and cultivated thereto, and wiſely ſet apart by the Government for ſuch Purpoſes, and properly ſituated and fitted with Inſtruments for ſo good, ſo great, ſo glorious, and ſo incomparable a Work: I ſay, as I would allow him all the Honour and Praiſe due unto him, ſo I hope it will be far from him to arrogate to himſelf what is really my Due, in being the Author of the following Scheme from the Moon's Altitude, to diſcover the Longitude at Sea thereby, which I hope will be found of particular Service, ſo ſoon as the Great

Great Dr. *Halley* ſhall think proper to publiſh his Calculations for this Purpoſe; which I hope he will now haſten to do for the Benefit of the Publick.

The Scheme from the Moon's Altitude is entirely new, having never before my Propoſal thereof, been mentioned by any antient or modern Author, and is deſi n'd for the Mariners to correct the Accounts of their Longitude, ſo often as they ſhall have Opportuni ies to make Obſervations therefrom: The other, from the Moon's Application to, and eperation from the fixed Stars, was as new to me in the propoſing it; but I have been ſince informed, by ſeveral judicious Examiners, that that *Method* had been before thought on; but as this was unknown to me when I drew up the Scheme thereof, and it likewiſe appearing to be very uſeful on the aforeſaid Account, and upon the ſame Dependance, I have therefore lay'd it down in my own Words, which, tho' they are not fill'd with Rhetorick and Eloquence, I can affirm they are done to a general Truth; and *I* believe *I* may boldly tell the World, that no other *Method* may be expected, that can be more uſeful to this End, than what is here incerted in theſe Schemes: What Improvements the Moon's Calculation, or the Calculations of the Inſtruments fitted for the Occaſion may admit of, I leave to them whoſe proper Buſineſs it is, and who I hope will join with me to compleat the Work.

Now

The PREFACE.

Now as I have ever desir'd to be useful to the World, and serviceable in my Generation, so I desire in this Affair, to cast in my Mite into the Publick Treasury, hoping the World will reap an universal Benefit by it; not only the present, but all succeeding Generations, which is the Desire of

The Well-Wisher of all Mankind,

BENJ. PARKER.

PARKER's

Parker's Longitude at Sea, *&c.*

To His moſt Excellent Majeſty

King GEORGE the Second.

Moſt Gracious Sovereign,

BELIEVING I have found out Means, whereby the Longitude on the Seas may be diſcover'd, I deſire humbly, and with all Submiſſion beg Leave to offer my Propoſals on this Subject, to Your Sacred Majeſty's Conſideration.

I beg your Majeſty's moſt gracious Pardon, tho' I cannot expreſs my Notions in thoſe Rhetorical Flouriſhes, and Eloquent Periods, becoming your Majeſty's Audience and Attention; but truſting my mean Perfo mances will be Pardoned and accepted, if they Anſwer the End deſign'd, I ſhall proceed to lay down the Methods I have Projected.

The Firſt from the Altitude of the Moon, at the Time of her Southing. Practicable by the help of a large and exact Quadrant, fitted for the aftermentioned Purpoſe; in the Proſecution of which it will be neceſſary to premiſe theſe things following, viz. That the Altitude of the Moon, at the Time of her Southing, be calculated at a fixed Place, which Place alſo muſt be reſpected as a fixed Meridian, and the Elevation of the

Pole, at that Place exactly observed. 2dly, That the Altitude of the Moon at its Southing, in a different Latitude to the Fixed Place encreaseth or decreaseh in almost the same Proportion, to the decrease or encrease of the Pole's Elevation, but not exactly because of the nearness of her Orbit to the Earth, but towards the Pole of th something more of Altitude, than the Pole gains of Elevation and towards the Equinoctial gains more than the Pole loseth, which ought to be considered, and determined to a just Proportion. 3dly, That for every Degree she moves in her Orbit, she loseth about 3 minutes and 40 Seconds of Time; or which is all one, without any Sensible Error, 2 Minutes for every Hour: which the Navigators will have Occasion to observe in the following Method, to discover the exact Distance of the Meridian from the fixed.

In the first Place, Then let the Navigators at the Time of the Moon's Southing, take the Elevation of the Pole and the true Altitude of the Moon, and observe how much the Pole is more or less Elevated than at the fixed Place; then let them acquaint themselves by the Calculations aforesaid, with the Altitude of the Moon at the fixed Place, at the Time of its Southing there; after which, let the Degrees and minutes of the less Elevation of the Pole with themselves, than at the fixed place, be added to the minutes and Seconds that the Moon has gain'd of Altitude, more than the Pole has lost of Elevation, and substract the Sum of both from that Altitude of the Moon which the Navigators find it to have with themselves at the Time of its Southing, and the Remainder will be the Altitude of the Moon, in a Parallel of Latitude to the given place under the Meridian of the Observators: If the Pole's Elevation be more with the Navigators than at the fixed place, let the degrees and minutes of its more Elevation, with the minutes and Seconds that the Moon has lost of Altitude more than the Pole has gained of Elevation, be both added to that Altitude of the Moon at the aforesaid place of Observation; and the Sum thereof, will be the Altitude of the Moon, in a Parallel of Latitude to the given

place

place under the meridian of the Obſervators; which being thus obtain'd, let them take Account of the Difference of the Degrees and minutes of the Moon's Altitude, at the Time of its Southing at the Given Place, and the Degrees and minutes of its Altitude, found by the aforeſaid method under their meridian in Parallel Latitude to the Given place; and by obſerving how much the *Moon* gaineth or loſeth of its Altitude, between its Southing before and her Southing after, they may from thence determine how long ſhe has been, or will be, in gaining or loſing the Degrees and minutes of the *Difference*, which Time gives the Diſtance of Meridians, whether Weſt or Eaſt, within the Time that the Moon loſeth by her menſtrual motion; which is before obſerv'd to be about 2 minutes for every Hour's Diſtance of Meridians; therefore, according to the Diſtance thereof, found by the abovementioned Rules, let the Proportion of two minutes for every Hour's Diſtance, be ſubſtracted from the Diſtance above obſerv'd, and the Remainder will be the true Diſtance of Meridians, from whence their Longitude is diſcover'd.

While the Moon's Declination is Southward, the Degrees of her Altitude will be more on the Eaſt Side of the Given Place, and leſs on the Weſt, *& è Contrà*.

This method may not only be practiſed while the Moon's South, when the North Pole may be ſeen, but alſo at any Time of the Day, when they from their laſt Obſervations, have a true Knowledge of their Latitude at the Time of her Southing, while her Diſtance is ſo far from the Sun as to be ſeen in the Day-Time.

When the Navigators are ſo near the Equinoctial Line, or Torrid Zone, that the *Moon* in the Northern Signs ſhall caſt their Shadows Southward, let them obſerve how many Degrees they are beyond the perpendicular of it, at the Time it becomes North to them, and add theſe Degrees and minutes to 90, the perpendicular thereof; and then work by the Rules aforeſaid, and from thence they may diſcover their Longitude on this Side of the Equinoctial.

And for the Diſcovery thereof beyond the Line, let another Place be imagin'd of the ſame Degrees of Latitude towards the South Pole, as the Fixed Place towards the North Pole, and in Parallel Meridian thereto, and the Moon's Altitude alſo calculated thereto, at the Time it becomes North; and the ſame Obſervations may from thence be taken and perform'd by the foregoing Rules.

But as few general Rules are without Exceptions, ſo this lies liable to ſome, as when the Moon changeth her Declination from North to South, or from South to North, will render the method here inserted impracticable during theſe Intervals; or at ſuch Seaſons, when ſhe gains North Latitude upon her Change to Southern Declination, or South Latitude upon her Change to Northern Declination: The Practice will be render'd intricate ſome Time upon theſe Changes, but may be reduced to Rules upon the Principles of the foregoing Scheme, or the Practice omitted till the Intricary be over.

An Advertiſement to the former Propoſal.

WHereas I obſerv'd that the Moon, according to her mean Motion, loſeth about 2 minutes of Time for every Hour's Diſtance of *Meridians*; let it be noted, that ſometimes ſhe loſeth more, and ſometimes leſs; therefore, let it be obſerv'd how much ſhe loſeth between Southing and Southing, and when ſhe loſeth about 49 or 50 minutes, which nearly anſwers her mean Motion, the Proportion of 2 minutes for each Hour's Diſtance muſt be exact: When ſhe loſeth more than 50 between Southing and Southing, (which anſwers neareſt to 48 in 24 Hours) let the Proportion of 5 Seconds be added for every 2 minutes it loſeth more than 50, to the 2 minutes of Loſs for every Hour's Diſtance of Meridians; if ſhe loſeth leſs than 50 between Southing and Southing, for every 2 minutes of leſs Loſs, the Proportion of 5 Seconds, muſt be ſubſtracted from the 2 minutes Loſs of every Hour's Diſtance of *Meridians*, becauſe 24 Times 5 Seconds makes 2 minutes.

The

THE other Method I ſhall propoſe, is from the Moon's Diſtance from ſome of the moſt obſervable fixed Stars at the Time of their Southing; which take as follows.

Let a proper Number of the moſt noted fixed Stars that ſhall happen near the Path of the Moon, have the exact Time of their Southing Calculated, as it will happen at a fixed Place and Meridian, with the Moon's Diſtance from any of them at the ſame Time, as ſhe ſhall apply to or ſeperate from them, with Reſpect to the Moon's Path, as it ſhall cut the Meridian Line of the Star then to be obſerv'd, whether the ſaid Star ſhall be North or South from the Path of the Moon at that Time; then let the Navigators at the Time of the Southing of the Star to be obſerv'd with themſelves, take the true Diſtance of the Moon from the Meridian Line of the ſaid Star, where the Moon has croſs'd, or ſhall croſs it, and obſerve how much ſhe is nearer thereto, or farther therefrom than ſhe was, or will be at the fixed Meridian at the Time of its Southing there; and by obſerving how much ſhe moves between the Noon before, and the Noon after, they may from thence determine how long ſhe has been, or will be, in moving the Degrees and Minutes of the Difference, which Time gives the Diſtance of Meridians, within the Time that the Solar Day loſeth of the Syderial, which is about one Minute of Time in 6 Hours, or 10 Seconds in one Hour; the Proportion of which muſt be added to the Diſtance above obſerv'd, and the Sum thereof is the true Diſtance of Meridians from whence their Longitude is diſcover'd.

When the Moon is not near South when the fixed Stars may be ſeen, let any other proper Hour be taken for the Calculation of their Diſtance from any of the ſaid Stars ſhe is then neareſt, a Conſideration being had of her then Poſition thereto in the Calculation thereof; for in her Application before their Southing, ſhe will be ſomething nearer in Appearance to the Meridian Line thereof, than at the Place where the ſaid Star is really South, and further therefrom in her Seperation; and after their Southing, nearer in her Seperation, and further in her Application; which being conſidered and adjuſted to a true Proportion, according to her Diſtance from the Earth in the Calculation thereof, let the Navigators at the ſame Hour with themſelves, that their Diſtance was calculated for at the Meridian aforeſaid, draw a Meridian Line from the Poſe over the Star to be obſerv'd and take the Moon's Diſtance from the Meridian Line of the ſaid Star in her own Path, and by the Rules above laid down,

down, they may from thence determine the Diſtance of their Meridian from the Fixed; ſince taking their Obſervations at the ſame Hour with themſelves, that the Poſition was calculated to, the Poſition both of Moon and Star muſt be nearly the ſame, both with Calculator and Obſervator, that no ſenſible Error can thence ariſe.

The ſame ſeems practicable from any of the three Superior Planets, when at a convenient Diſtance from the Sun, and ſometimes from *Venus* a Reſpect being had to their Motions, whether direct or retrogade, as the ſame wou'd cauſe more or leſs Time to be added to, or ſometimes by the Motion of **Venus*, ſubſtracted from the firſt obſerv'd Diſtance of Meridians.

When they have not the Opportunity of making Obſervations at the true Hour of the aforeſaid Calculations, by Reaſon of Clouds, and a more favourable Opportunity happens at another Hour of the Night, let them then take the Moon's true Diſtance from the Star to be obſerv'd, with Reſpect to the Moon's then different Poſition, as above directed; and from thence they may determine the Hour of the Night at the fixed Meridian; and by knowing the Hour of the Night with themſelves, they have from thence the Diſtance of Meridians.

ADVERTISEMENT.

TO find the true Path of the Moon, let the Difference of the Latitude of the Star to be obſerv'd, and the Latitude of the Moon from the Ecliptick, when ſhe paſſeth the Meridian Line of the ſaid Star, be taken, and the Degrees and Minutes being meaſured from the ſaid Star in the Meridian Line thereof, you have the Place of the Moon's Path; from whence her Diſtance muſt be taken, obſerving the Variation of her Latitude, in a different Latitude from the fixed Place, which, by the nearneſs of her Orbit to the Earth, will ſomewhat increaſe or diminiſh her Diſtance in Latitude from the Star to be obſerv'd, as ſhe paſſeth the Meridian Line thereof; as if the Star happen on the North Side of the Moon, at the Time of their true Conjunction, ſhe will appear nearer thereto to the Navigators, than at the fixed Place, as they approach towards the Equator and beyond the Line, and ſomewhat further therefrom towards the Pole, which ought to be conſider'd and allow'd for in finding the Moon's true Path; If the Star happen on the South Side 'twill

* When in Direction ſwifter than the Earth.

'twill be the contrary; and therefore a competent Knowledge of their Latitude will be neceſſary, to find the true Place of the Moon's Path, as ſhe paſſes the Meridian Line of the Star to be obſerv'd. Thus I have laid down my Propoſals in Brief, which I humbly ſubmit to be determin'd according to Your Moſt Gracious Majeſty's Wiſdom, And am,

Great Sovereign,

Your Majeſty's moſt Dutiful

And Loyal Subject,

BENJ: PARKER.

Erratum. *In the 2d Page of the Preface Line the 7th, read* Chriſtmas-Eve *for* Chriſtmas, even

FOR the Sake of the Ingenious, I ſhall add two other Methods, by which the Longitude at Land may be brought to an exact Correctneſs, tho' I believe not practicable at Sea.

Firſt, It is obſervable from Mr. *Kingſet's* Calculations, of the Emerſions and Immerſions of the firſt Satellite of *Jupiter* for the Year 1717, that this Satellite finiſhes his Periodical Revolution about *Jupiter*, in about 42 Hours and 29 Minutes; ſo that when *Jupiter* is at a convenient Diſtance from the Sun, there will be frequent Opportunities of Obſervations therefrom.

Let then the Time of theſe Emerſions, or Immerſions, be calculated, as they will happen at a fixed Meridian; then let the Obſervators at any diſtant Meridian (being fitted with proper Glaſſes) obſerve the exact Time that theſe Emerſions, or Immerſions, happen with themſelves, and the Difference of the Hour and Minute it is found to be between the Place of Calculation and the Place of Obſervation, is the Diſtance of Meridians, whether the Accounts of the Obſervators happen before, or after the Time of Calculation at the fixed Meridian.

Second Method. The like may be practiſed from thoſe dark and black Spots in ſome of the Planets, whereby the Times of their Diurnal Rotations are diſcover'd; and in this Reſpect, I take *Jupiter* to be moſt ſerviceable to our preſent Purpoſe, whoſe Revo-

Revolution about his own Axis, is perform'd in 9 Hours and 56 Minutes; as Dr. *Derham* (from the repeated Obſervations of Monſ. *Caſſini*, the firſt Diſcoverer thereof, from the Spots obſervable on it,) aſſures us in his Aſtro'Theology, Page the 76th and 77th; by the Swiftneſs of whoſe Motion, there will be frequent Opportunities of Obſervation therefrom.

Let then the moſt remarkable of theſe Spots in *Jupiter* be agreed upon, ſo that there be a right Underſtanding between the Calculators and Obſervators of the ſame; then let the exact Time of this Spot's Appearance on the exact Middle of *Jupiter's* Diſk, be calculated as it will happen at a fixed Meridian; then let the Obſervators at a diſtant Meridian, take Notice of the exact Time that this Spot has the ſame Poſition with themſelves, and the Difference there is between the Hour and Minute of its Calculation: and the Time it is found to be at the Place of Obſervation, is the Diſtance of Meridians, &c.

The ſame might be done by the Calculation of this Spot's Appearance into Sight from, or Diſappearance out of Sight to the other Side; but whether this will be practiſed without Difficulty, I leave to be conſider'd.

P. S. This Scheme has been examin'd and approv'd of, (as without Error or Objection) upon the aforeſaid Suppoſition, of the Truth of the Moon's Calculation, by Mr. *Whiſton*, Mr. *Hawkſby*, Mr. *Bendor* and others.

FINIS